

# PATENT ABSTRACTS OF JAPAN

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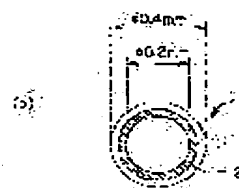
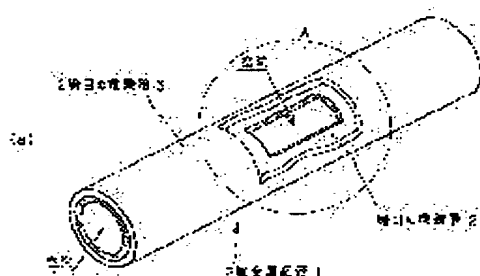
(72)Inventor : NAKADA NAOYUKI

## (54) METHOD OF PRODUCING DOUBLE METAL THIN TUBE

### (57)Abstract:

**PROBLEM TO BE SOLVED:** To provide a double metal thin tube in which the first layer consists of a metal such as Au, Ag and Cu, and the second layer consists of metal different from the above metal, and to provide a method of producing the double metal thin tube.

**SOLUTION:** In the method of producing a double metal thin tube, an electroformed layer 2 consisting of any one metal selected from Au, Ag and Cu is formed around at least one mirror-finished metal core wire by electroforming, further, an electroformed layer 3 consisting of the metal different from the above metal is formed on the electroformed layer 2 by electroforming to form a bar-shaped electroformed body, and the metal core wire is pulled out or extruded from the electroformed body, so that the double metal thin tube 1 is produced.



## LEGAL STATUS

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CLAIMS

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[Claim(s)]

[Claim 1]

The double metal capillary characterized by consisting of a electrocasting layer which consists of a metal of a different class from said metal formed of electrocasting on the electrocasting layer which consists of the bore 0.05 formed of electrocasting thru/or 1mm, thickness 0.05, or any one 5-micrometer metal of Au, Ag, and the Cu, and this electrocasting layer.

[Claim 2]

Around at least one metal core wire by which mirror plane finishing was carried out, by electrocasting, Au, The electrocasting layer which consists of any one metal of Ag and the Cu is formed. Further on said electrocasting layer The manufacture approach of the double metal capillary characterized by producing a double metal capillary by forming the electrocasting layer which consists of a metal of the class which differs from said metal by electrocasting, forming a rod-like electrocasting object, and drawing out or extruding said metal core wire from said electrocasting object.

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DETAILED DESCRIPTION

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[Detailed Description of the Invention]

[Field of the Invention]

[0001]

This invention relates to the manufacture approach of a double metal capillary and a double metal capillary.

[Background of the Invention]

[0002]

Generally, metal plating is used for coat processing and used for the accessories of metal goods, rust prevention, etc. Forming a electrocasting layer in a wire rod, sampling a wire rod from a electrocasting layer using such a electrocasting technique, and manufacturing metal electrocasting tubing in recent years is performed.

[0003]

Without making a metal deposit, forming a rod-like electrocasting object, and performing the above-mentioned wire rod for the dissolution etc. in JP,3308266,B by electrocasting, around one wire rod, the above-mentioned wire rod is removed from the above-mentioned electrocasting object, and the method of manufacturing a ferrule is indicated [ extrude / a electrocasting object to / drawing or ].

Moreover, the electrocasting equipment for capillary manufacture which made it possible to manufacture a metal capillary like a ferrule efficiently with high degree of accuracy is indicated by JP,3461177,B.

[0004]

[Patent reference 1] JP,3308266,B

[Patent reference 2] JP,3461177,B

[Description of the Invention]

[Problem(s) to be Solved by the Invention]

[0005]

Like \*\*\*, by electrocasting, electrocasting layers, such as copper and nickel, are formed on core wires, such as stainless steel, and the method of manufacturing a metallic conduit is learned by drawing out a core wire from this electrocasting layer as a metallic conduit like a ferrule is shown also in above-mentioned JP,3308266,B as manufacture \*\*\*\*\*.

However, the method of manufacturing a double metallic conduit is not learned by drawing out a core wire from the electrocasting object which consists of a electrocasting layer which formed electrocasting layers, such as copper and nickel, on the core wire, formed the electrocasting layer which consists of still more nearly another metal on this electrocasting layer, and was formed in this duplex.

Furthermore, the method of manufacturing a double metallic conduit by drawing etc. is not learned in the core wire from the electrocasting object which consists of a electrocasting layer which formed the electrocasting layer which consists of metals, such as Au, Ag, and Cu, by electrocasting on core wires, such as stainless steel, formed the electrocasting layer which consists of a metal of a different class from said metal, and was further formed on said electrocasting layer of electrocasting at this duplex.

If it is going to draw out a core wire from the electrocasting object which consists of a electrocasting layer formed in the duplex in order that this may obtain a double metallic conduit, Un-arranging — the electrocasting layer of the 1st layer which consists of metals, such as Au, Ag, and Cu, will be damaged, or the electrocasting layer of the 1st layer and the electrocasting layer of a two-layer eye will dissociate, the metallic conduit which consists only of a electrocasting layer of a two-layer eye will be obtained, and a double metallic conduit is not obtained — had arisen.

[0006]

In view of the trouble of the above-mentioned conventional technique, as for the purpose of this invention, the 1st layer obtains the double metal capillary with which it consists of metals, such as Au, Ag, and Cu, and a two-layer eye consists of a metal of a different class from said metal, And the electrocasting layer of the 1st layer which consists of metals, such as Au, Ag, and Cu, is formed on core wires, such as stainless steel. Furthermore, the electrocasting layer of the two-layer eye which consists of a metal of a different class from the metal of the 1st layer is formed on that electrocasting layer of the 1st layer, and it is in offering the manufacture approach of a double metal capillary of obtaining a double metallic conduit by drawing out a core wire from the electrocasting object which consists of this double electrocasting layer.

[Means for Solving the Problem]

[0007]

The following means were used for this invention in order to solve the above-mentioned technical problem.

The 1st means is characterized by consisting of a electrocasting layer which consists of a metal of a different class from said metal formed of electrocasting on the electrocasting layer which consists of the bore 0.05 formed of electrocasting thru/or 1mm, thickness 0.05, or any one 5-micrometer metal of Au, Ag, and the Cu as a double metal capillary, and this electrocasting layer.

[0008]

The 2nd means as the manufacture approach of a double metal capillary around at least one metal core wire by which mirror plane finishing was carried out The electrocasting layer which consists of any one metal of Au, Ag, and the Cu by electrocasting is formed. Furthermore, on said electrocasting layer, the electrocasting layer which consists of a metal of the class which differs from said metal by electrocasting is formed, a rod-like electrocasting object is formed, and it is characterized by producing a double metal capillary by drawing out or extruding said metal core wire from said electrocasting object.

[Effect of the Invention]

[0009]

According to invention according to claim 1, the double metal capillary which consists of a electrocasting layer which consists of a metal of a different class from said metal formed of electrocasting on the electrocasting layer which consists of the bore 0.05 formed of electrocasting thru/or 1mm, thickness 0.01, or any one 5-micrometer metal of Au, Ag, and the Cu, and this electrocasting layer and which was not obtained until now can be obtained.

[0010]

According to invention according to claim 2, around at least one metal core wire by which mirror plane finishing was carried out The electrocasting layer which consists of any one metal of Au, Ag, and the Cu by electrocasting is formed. Furthermore, the double metal capillary which was not obtained until now is producible by forming the electrocasting layer which consists of a metal of the class which differs from said metal by electrocasting on said electrocasting layer, forming a rod-like electrocasting object, and drawing out or extruding said metal core wire from said electrocasting object.

[Best Mode of Carrying Out the Invention]

[0011]

One operation gestalt of this invention is explained using drawing 1 thru/or drawing 3.

The perspective view in which drawing 1 (a) shows the configuration of the double metal capillary of this invention, and drawing 1 (b) are the side elevations of the double metal capillary shown in drawing 1 (a).

[0012]

The double metal capillary with which 1 was produced by electrocasting in these drawings, the bore 0.05 in which 2 was formed of electrocasting, or 1mm. The electrocasting layer which consists of metals, such as different nickel from the metal of the electrocasting layer which consists of thickness 0.05 thru/or any one 5-micrometer metal of Au, Ag, and the Cu, and the electrocasting layer 2 in which 3 was formed of electrocasting on the electrocasting layer 2, and A are the parts which carried out opening of some double metal capillaries 1, and showed it. In addition, an example of the dimension of each part of a double metal capillary is shown in drawing 1 (b).

[0013]

Drawing 2 is drawing showing the outline of the production process of the double metal capillary 1 of this invention. First, manufacture of a double metal capillary prepares the core wire 4 which consists of a diameter 0.05 thru/or 1mm stainless steel, etc. by which mirror plane finishing was carried out, as shown in drawing 2 (a). Next, as shown in drawing 2 (b), in order to electroform around a core wire 4, a core wire 4 is immersed in the electrocasting tub of the well-known electrocasting equipment for capillary manufacture which is not illustrated. In this electrocasting equipment for capillary manufacture, the electrocasting layer 2 which becomes the perimeter of a core wire 4 from thickness 0.05 thru/or any one 5-micrometer metal of Au, Ag, and the Cu by electrocasting is formed. Next, as shown in drawing 2 (c), the electrocasting layer 3 which consists of metals, such as nickel, by electrocasting is formed in the perimeter of the electrocasting layer 2 using the electrocasting equipment for capillary manufacture as shown in different drawing 3 from said electrocasting equipment for capillary manufacture. Next, as shown in drawing 2 (d) after electrocasting, the electrocasting object with which the electrocasting layers 2 and 3 of a duplex were formed on the core wire 4 is picked out from said electrocasting equipment for capillary manufacture, and said core wire 4 is drawn out or extruded from this electrocasting object. Consequently, as shown in drawing 2 (e), the double metal capillary with which the electrocasting layer 3 was formed on the electrocasting layer 2 can be obtained.

[0014]

Drawing 3 is drawing showing an example of the electrocasting equipment for capillary manufacture used in order to form the electrocasting layer 3 by electrocasting further on the electrocasting layer 2 formed in the perimeter of a core wire 4.

In this electrocasting equipment for capillary manufacture, 5 is formed in the shape of a doughnut (annular). The electrocasting tub by which the radial cross section was letter [ of the abbreviation for U characters ]-formed, and was filled with the electrolytic solution 6. The overflow tub which stores the electrolytic solution 6 heated by predetermined temperature while filtering the electrolytic solution 6 which 7 was prepared in the outside of the electrocasting tub 5, and was overflowed from the electrocasting tub 5. The heater which heats the electrolytic solution 6 with which 71 was stored by the overflow tub 7 to predetermined temperature, 8 rotates with rotation of a turntable 9 and rotate the inside of the electrocasting tub 5 to a circumferencial direction in support of the core wire electrode holder 10. Dozens of rib-like arms (60 [ for example, ]) arranged at the radial and 9 So that the thick

predetermined electrocasting layer 3 may be formed in the front face of the electrocasting layer 2 formed in the perimeter of a core wire 4 while carrying out the inside of the electrocasting tub 5 1 round While the turntable which rotates with crawling (for example, 1-round about 4 hours), and 10 are supported by the arm 8 and arranged in support of a core wire 4 by the revolution motor 13 at an electrolyte level, abbreviation parallel, and a radial radial [ of the electrocasting tub 5 ] The core wire electrode holder prepared so that the inside of the electrolytic solution 6 of the electrocasting tub 5 might be rotated to a circumferencial direction, Since the electrocasting layer 3 is formed in electrocasting layer 2 front face at homogeneity, the anode case where, as for 11, the electrocasting ingredient (for example, nickel ball with a diameter of 5mm - 6mm) was contained, and 12 The rotation motor for making a core wire 4 rotate (for example, 20 - 40 revolution per minute), In order that it may attach or demount and the revolution motor which 13 makes rotate a turntable 9, the rise-and-fall motor by which 14 goes up and down the rise-and-fall arm 15, and 15 may use the core wire electrode holder 10 as an arm 8 The filter for the rise-and-fall arm which makes it go up and down an arm 8 from the electrocasting tub 5, and 16 filtering the electrolytic solution 6 stored by the overflow tub 7, and making the electrocasting tub 5 circulate through them except for an impurity, The reflux pump which 17 circulates the electrolytic solution 6 in the electrocasting tub 5, and attains equalization of the electrolytic solution 6, The slip ring for 18 to plan electrical installation of the fixed side wired from the current control unit 19, and the movable side wired from the core wire electrode holder 10 rotating around the inside of the electrocasting tub 5, 19 was controlled by the computer 21 and have been arranged in the doughnut-like (annular) electrocasting tub 5. The current control unit which was supported by dozens of sets (for example, 60 sets) of core wire electrode holders 10 and which carries out current control every core wire 4, and 20 a power unit (for example, DC8V, 100A rating) and 21 It is the computer formed in order to direct to intercept the current which flows to each core wire 4, when the current value which flows to each core wire 4 is directed to the current control unit 19 according to a predetermined current pattern property and a predetermined current addition value is reached.

[0015]

An arm 8 carries out the circumferencial direction of the electrocasting tub 5 1 round, the rise-and-fall motor 13 will rotate, the rise-and-fall arm 15 will go up in connection with it, and this electrocasting equipment for capillary manufacture will be lifted on the 6th page of the electrolytic solution of the electrocasting tub 5, if the arm 8 by which the electrocasting layer 3 was formed in the front face of the electrocasting layer 2 reaches a core wire electrode-holder attachment-and-detachment part. If an arm 8 is raised, removal of the core wire electrode holder 10 which supports the core wire 4 with which the electrocasting layer 3 was formed will be attained from an arm 8. If the core wire electrode holder 10 furnished with a core wire 4 is attached in an arm 8 in order that the core wire electrode holder 10 may be removed from an arm 8 and may newly electroform, again, the rise-and-fall motor 15 will rotate, the rise-and-fall arm 15 will descend, it will be immersed in the electrolytic solution 6 of the electrocasting tub 5 in an arm 8, and electrocasting will be started.

[0016]

During electrocasting processing, each core wire 4 becomes possible [ forming the high electrocasting layer 3 of roundness and coaxiality in the front face of the electrocasting layer 2 ], while rotating the inside of the doughnut-like electrocasting tub 5 to a circumferencial direction (revolution), since it is rotating by the rotation motor 12 (rotation).

[0017]

Each core wire 4 is electrically connected from the minus side of a power unit 20 through the current control unit 19, the slip ring 18, an arm 8, and the core wire electrode holder 10, and, on the other hand, the anode case 11 is connected electrically the plus side of a power unit 20. Consequently, the current which flows between a core wire 4, the electrocasting layer 2, and the anode case 11 is controlled by the current control unit 19, and each core wire 4 can form the thick predetermined electrocasting layer 3 in electrocasting layer 2 front face with it, while rotating within the doughnut-like electrocasting tub 5 and carrying out the inside of the electrocasting tub 5 1 round (revolution).

[Brief Description of the Drawings]

[0018]

[Drawing 1] It is the perspective view and side elevation showing the configuration of the double metal capillary of this invention.

[Drawing 2] It is drawing showing the outline of the production process of the double metal capillary of this invention.

[Drawing 3] It is drawing showing an example of the electrocasting equipment for capillary manufacture used in order to form the electrocasting layer 3 by electrocasting further on the electrocasting layer 2 formed in the perimeter of a core wire 4.

[Description of Notations]

[0019]

- 1 Double Metal Capillary
- 2 Electrocasting Layer of the 1st Layer
- 3 Electrocasting Layer of Two-layer Eye
- 4 Core Wire
- 5 Electrocasting Tub
- 6 Electrolytic Solution

7 Overflow Tub  
71 Heater  
8 Arm  
9 Turntable  
10 Core Wire Electrode Holder  
11 Anode Case  
12 Rotation Motor  
13 Revolution Motor  
14 Rise-and-Fall Motor  
15 Rise-and-Fall Arm  
16 Filter  
17 Reflux Pump  
18 Slip Ring  
19 Current Control Unit  
20 Power Unit  
21 Computer

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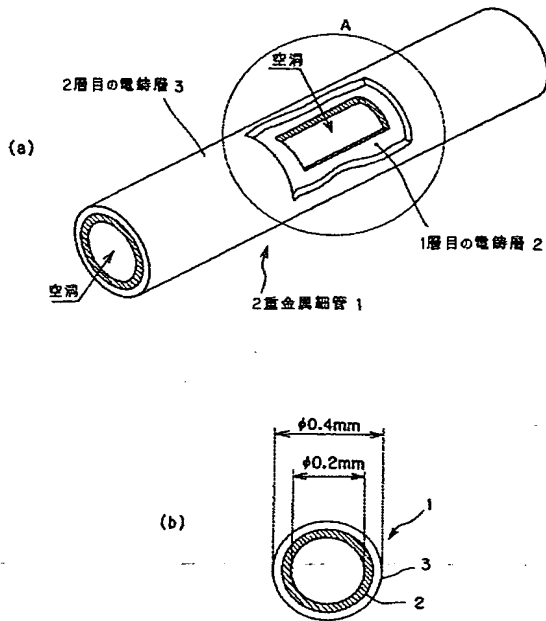
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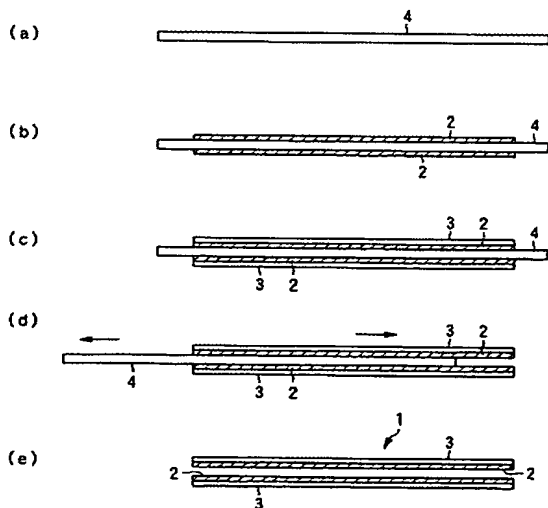
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## DRAWINGS

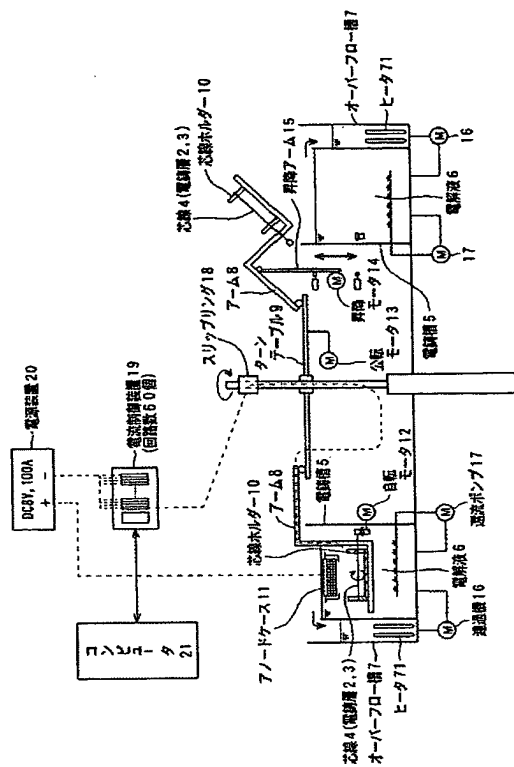
[Drawing 1]



[Drawing 2]



[Drawing 3]



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## WRITTEN AMENDMENT

[Procedure revision]

[Filing Date] December 10, Heisei 15 (2003. 12.10)

[Procedure amendment 1]

[Document to be Amended] Claim

[Item(s) to be Amended] Whole sentence

[Method of Amendment] Modification

[The contents of amendment]

[Claim(s)]

[Claim 1]

Around at least one stainless steel core wire by which mirror plane finishing was carried out, by electrocasting, a bore 0.05 thru/or 1mm, The electrocasting layer which consists of thickness 0.05 thru/or 5-micrometer Au is formed. Further on said electrocasting layer The manufacture approach of the double metal capillary characterized by creating a double metal capillary by forming the electrocasting layer which consists of nickel, forming a rod-like electrocasting object, and drawing out said stainless steel core wire from said electrocasting object by electrocasting.

[Procedure amendment 3]

[Document to be Amended] Specification

[Item(s) to be Amended] 0001

[Method of Amendment] Modification

[The contents of amendment]

[0001]

This invention relates to the manufacture approach of a double metal capillary.

[Procedure amendment 4]

[Document to be Amended] Specification

[Item(s) to be Amended] 0006

[Method of Amendment] Modification

[The contents of amendment]

[0006]

The purpose of this invention forms the electrocasting layer of the 1st layer which consists of Au on a stainless steel core wire in view of the trouble of the above-mentioned conventional technique. Furthermore, the electrocasting layer of the two-layer eye which consists of different nickel from the metal of the 1st layer is formed on that electrocasting layer of the 1st layer, and it is in offering the manufacture approach of a double metal capillary of obtaining a double metallic conduit by drawing out a stainless steel core wire from the electrocasting object which consists of this double electrocasting layer.

[Procedure amendment 5]

[Document to be Amended] Specification

[Item(s) to be Amended] 0007

[Method of Amendment] Modification

[The contents of amendment]

[0007]

The following means were used for this invention in order to solve the above-mentioned technical problem.

The 1st means as the manufacture approach of a double metal capillary around at least one stainless steel core wire by which mirror plane finishing was carried out The electrocasting layer which consists of a bore 0.05 thru/or 1mm, thickness 0.05, or 5-micrometer Au by electrocasting is formed. Furthermore, it is characterized by creating a double metal capillary by forming the electrocasting layer which consists of nickel, forming a rod-like electrocasting object, and drawing out said stainless steel core wire from said electrocasting object by electrocasting, on said electrocasting layer.

[Procedure amendment 6]

[Document to be Amended] Specification

[Item(s) to be Amended] 0008

[Method of Amendment] Deletion

[The contents of amendment]

[Procedure amendment 7]

[Document to be Amended] Specification

[Item(s) to be Amended] 0009

[Method of Amendment] Modification

[The contents of amendment]

[0009]

According to invention according to claim 1, around at least one stainless steel core wire by which mirror plane finishing was carried out By forming the electrocasting layer which consists of a bore 0.05 thru/or 1mm, thickness 0.05, or 5-micrometer Au by electrocasting, forming the electrocasting layer which consists of nickel by electrocasting, and forming a rod-like electrocasting object on said electrocasting layer, further Said stainless steel core wire can be easily drawn out from said electrocasting object, and the double metal capillary which was not obtained until now can be produced easily.

[Procedure amendment 8]

[Document to be Amended] Specification

[Item(s) to be Amended] 0010

[Method of Amendment] Deletion

[The contents of amendment]

[Procedure amendment 9]

[Document to be Amended] Specification

[Item(s) to be Amended] 0012

[Method of Amendment] Modification

[The contents of amendment]

[0012]

The electrocasting layer which consists of the double metal capillary with which 1 was produced by electrocasting, the bore 0.05 in which 2 was formed of electrocasting or 1mm, thickness 0.05, or 5-micrometer Au in these drawings, the electrocasting layer which consists of nickel with which 3 differs from the metal of the electrocasting layer 2 formed of electrocasting on the electrocasting layer 2, and A are the parts which carried out opening of some double metal capillaries 1, and showed it. In addition, an example of the dimension of each part of a double metal capillary is shown in drawing 1 (b).

[Procedure amendment 10]

[Document to be Amended] Specification

[Item(s) to be Amended] 0013

[Method of Amendment] Modification

[The contents of amendment]

[0013]

Drawing 2 is drawing showing the outline of the production process of the double metal capillary 1 of this invention. First, manufacture of a double metal capillary prepares the diameter 0.05 thru/or the 1mm stainless steel core wire 4 by which mirror plane finishing was carried out, as shown in drawing 2 (a). Next, as shown in drawing 2 (b), in order to electroform around the stainless steel core wire 4, the stainless steel core wire 4 is immersed in the electrocasting tub of the well-known electrocasting equipment for capillary manufacture which is not illustrated. In this electrocasting equipment for capillary manufacture, the electrocasting layer 2 which becomes the perimeter of the stainless steel core wire 4 from thickness 0.05 thru/or 5-micrometer Au by electrocasting is formed. Next, as shown in drawing 2 (c), the electrocasting layer 3 which consists of nickel by electrocasting is formed in the perimeter of the electrocasting layer 2 using the electrocasting equipment for capillary manufacture as shown in different drawing 3 from said electrocasting equipment for capillary manufacture. Next, as shown in drawing 2 (d) after electrocasting, the electrocasting object with which the electrocasting layers 2 and 3 of a duplex were formed on the stainless steel core wire 4 is picked out from said electrocasting equipment for capillary manufacture, and said stainless steel core wire 4 is drawn out from this electrocasting object. Consequently, as shown in drawing 2 (e), the double metal capillary with which the electrocasting layer 3 which consists of nickel was formed on the electrocasting layer 2 which consists of Au can be obtained.

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[Translation done.]